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General Notes.

GEOLOGY AND PALEONTOLOGY.

The Geological Structure of the Mount Washington Mass of the Taconic Range.—The recent studies of Mr. Wm. H. Hobbs have disclosed new facts with regard to the Mount Washington Mass and the conclusions that the author draws from the data now known differ somewhat from those reached by Mr. Dana regarding the structure of Mt. Washington.

Mr. Hobbs' paper is prefaced by the following brief account of the topography of the region in question:

"That portion of the Taconic Range which is known as Mount Washington is both topographically and geologically a unit. It covers an elongated elliptical area, about fifteen miles in length and four and one-half miles average breadth, lying in the states of Massachusetts. Connecticut and New York. It occupies the entire township of Mt. Washington and portions of Sheffield and Egremont in Massachusetts; about one-third of Salisbury in Connecticut; and portions of North-east Ancram, Copake and Hillsdale in New York.

The Mt. Washington mass is a double ridge enclosing a summit plain. Mt. Everett, or the "Dome of the Taconics" (2624 ft.), lying in the eastern ridge, is the highest peak and one of the highest elevations in Massachusetts, while the Bear Mountain (2355 ft.) is the highest point of land in the state of Connecticut. The main summit plain is situated to the northward centre of the mass and has an average altitude of about 1700 feet. Corresponding with the elliptical outline of the mountain, this plain is compressed at the north and south, so that its length is about three miles and its breadth two miles. Encircling it is a line of peaks ranging from 1900 to 2600 feet in height. This encircling wall of peaks is buttressed by other peaks both to the northward and to the southward, the southern side being strengthened, by a parallel belt across the mountain, composed of Mts. Bear, Gridley, Frissell and Monument. Southward of this belt of hills the elevated plateau recurs, but without the rampart of peaks which characterize it in the northern and more central area.

"The Salisbury-Sheffield valley on the east and the Copake-Hillsdale valley on the west of the mass, constitute a floor having an average altitude of 700 feet, from which Mt. Washington rises abruptly, the mean slope-angle being 20°. The southern boundary of the mountain is the nearly east and west valley through which runs the Central New England and Western Railroad. On the northwest Mt. Washington is merged into the narrow ridge of the Taconics, which extends northward into Vermont. The name, Mt. Washington, however, applies properly to all of the range lying south of the South Egremont-Hillsdale turnpike. The regular elliptical contour of the mass is broken on the northeast by two deep embayments, the eastern one containing Fenton Brook, and the western, which is knee-shaped, being occupied by Sky Farm Brook. The regularity of contour is further interrupted by an outjutting spur on the west side, known as Cook's Hill. South of the topographical break which limits the mountain in the neighborhood of Ore Hill, the range of the Taconics pursues a more interrupted course, the hills becoming smaller and spreading out considerably."

In the account of his investigations the author states that a microscopic examination of thin sections of rocks from Mt. Washington shows clearly that they are strongly metamorphosed clastics. Evidence has been deduced from the secondary growths of feldspars, garnets and tourmalines, as well as from the relations of the different metamorphic minerals to one another, to show that the orographic forces to which these minerals owe their development, operated in several more or less distinct periods.

What is set forth in the paper agrees with Professor Dana's views so far as the northern portion of the area is concerned. It is in regard to the southern and central portions that different views are entertained. Mr. Hobbs attributes this difference, not to errors in Professor Dana's observations, for in the main they have been confirmed, but to the collection of a larger number of observations and to the application of some structural principles which were not made use of by Professor Dana.

In conclusion Mr. Hobbs gives the following summary of the results discussed in the paper:

"The Mt. Washington series consists of four members which, in order of age are as follows: (1) Canaan Dolomite, (2) Riga Schist, (3) Egremont Limestone, and (4) Everett Schist. A somewhat striking lithological distinction is found to separate the two schist horizons, the Everett shist being entirely free from garnet and staurolite, while the Riga shist usually (not always) contains macroscopic crystals of one or both. The older rocks are found in the southern portion of the area, a general northerly pitch carrying them successively below the surface as we proceed northward, until at the north end of the mountain we find the upper two members of the series only.

"The structure of the mass may be summarized by stating that the beds have been thrown into corrugated folds which seem to have moderate, tolerably symmetrical corrugations at the south end of the mountain, but these corrugations deepen and become frequently overturned as we proceed northward. In the eastern portion of the area the axes of the reversed folds is generally westward. At the extreme south, the structure is a geo-anticlinal, but this develops in the central and northern parts of the area into a geo-synclinal owing to the continual disproportionate deepening and widening of one of its minor western corrugations. The general pitch of the beds is north. A less important southerly pitch which characterizes the northern portion of the area, in combination with the general synclinical structure in cross sections, gives to all the mountain except its extreme southern portion a basin-like character. The rocks are throughout strongly metamorphosed clastics, the orographic disturbances to which they owe their marked crystalline character and porphyritic crystals having operated in several distinct periods. The Egremont Limestone shows a marked diminution in thickness as we proceed southward in the area until it almost disappears. Throughout the mountain plain it is greatly modified, being either a micaceous limestone or calcareous mica schist, or a graphitic schist. The graphitic rock is most developed near the schist contacts and in the southern portion is the only representative of the limestone (Journ. Geol., Vol. I, 1893).

Origin of the Pennsylvania Anthracite.—In a recent Bulletin of the Geological Society of America (Nov. 1893) Mr. J. J. Stevenson discusses the origin of the anthracite coal of Peensylvania. After stating the hypotheses that been advanced by Rogers, Owens, Murchison and Lesley, to account for the variation in the volatile combustibles in Pennsylvania coals, and pointing out objections to each in turn, the author offers one of his own, giving the facts upon which it is based. He conceives the coal-measures marsh to have had its origin to the east, and that it extended seaward after each period of accelerated subsidence, so forming a new coal bed. One should find, according to this hypothesis, a greater mass of coal in the northeastern portion of the Appalachian basin than in any other part, and also a greater degree of conversion. Observation has shown that this is the case. There is also a direct relation between the increasing thickness of coal and the decreasing volatile in Pennsylvania. This fact is demonstrated by Mr.

Stevenson in a table of ratios, the result of analyses made by Mr. A. S. McCreath.

In origin then, according to Mr. Stevenson, the anthracite of Pennsylvania differs in nowise from the bituminous coal of the Appalachian basin, but is the result of a longer exposure to the process of making.

Cretaceous System in Canada.—In a Presidental Address before the Roy. Can. Soc., Mr. Whiteaves gave a resumé of the present knowledge of the Cretaceous system in Canada. For convenience, he divides the system into Upper and Lower with the base of the Dakota group as a boundary line. In Manitoba and the Northwest Territories all the Cretaceous rocks as yet examined are referable to the upper division and are subdivided into 5 formations, viz.: Laramie, Montana, Belly River, Niobrara—Benton and Dakota. Of the Rocky Mountain region, inclusive of the Foot-Hills, the author states "that from the combined evidence afforded by the fossil flora and fauna of the Cretaceous rocks of this region it would appear that the Laramie, the Montana, the Niobrara-Benton and perhaps also the Dakota are there represented. The Kootanie series, and the Devil's Lake deposits are older than the Dakota formation and hence referable to the Lower North American Cretaceous." In British Columbia and the Yukon district, although the Cretaceous rocks have been studied and reported upon since 1871, the subdivisions have not yet been satisfactorily correlated with those of Manitoba.

In conclusion the author gives a tabular statement, showing the important additions that have been made to our knowledge of the Canadian Cretacic system since the confederation of the provinces in 1867. Prior to that time but little had been done; to-day, 108 species of fossil plants and 358 fossil animals have been recorded and described, exclusive of the Laramie, or 179 species of plants and 394 animals, inclusive of the Laramie (Trans. Roy. Soc. Can., Sect. IV, 1893).

Evidences of a Submergence of Western Europe at the close of the Glacial Period.—For a number of years Professor Joseph Prestwich has been investigating a peculiar superficial drift found in the south of England and extending over large continental areas. For this drift he proposes the name, Rubble-drift, to distinguish it from the valley, marine and glacial drift of the same regions. It includes a peculiar débris in Loess, the Breccia on slopes, the "Head" over the Raised Beaches, the Basement gravels of many valleys and the Ossiferous fissures. This drift is characterized by (1) being composed of material of local origin, (2) a complete absence of that wear which results from maintained river, sea or ice action, (3) organic remains which are those of a land fauna alone, (4) by bone fragments free from all marks of gnawing. In order to account for these conditions as well as for the mode of distribution of the rubble, which appears to be from many independent centres, Mr. Prestwich offers the following theory. The Rubble drift is the result of the submergence and re-elevation of a land surface from beneath deep waters after a temporary submergence.

According to the author, this submergence occurred at the close of the Glacial, or so-called Post-glacial period, and immediately preceding the Neolithic or recent period. The submergence affected western Europe and the Mediteranean coasts decreasing eastward. The Rubble-drift and osseous breccia are but slightly developed in Syria. In regard to the north coast of Africa, Mr. Prestwich doubts if the submergence extended beyond the Lybian desert, as there is no well defined proof of it in Egypt.

The significance of the Rubble-drift has an important bearing upon an estimate of the lapse of time since the close of the Glacial period. Mr. Prestwich calls attention to this in his closing remarks, citing evidence to show that Mr. Croll's reckoning of 80,000 years is not supported by the facts of geology. The position and character of the Rubble-drift shows that the transition from the so-called Post-glacial beds to the recent alluvial deposits is abrupt, and there is no absence of sedimentation or anything indicative of lapse of time between the two series. This conclusion is confirmed by sections of the Belgian caves.

Neither is the Croll theory, in the opinion of the writer, warranted by archeological evidence, for "it is hardly probable," to quote the author, "that Man, who showed himself progressive early in the Quaternary period, could towards its close, have remained for, say 70,000 years, without further progress than that shown by Man of the early Stone period. There is nothing to represent, geologically, that long period of time, nor have biologists been able to detect any essential structural differences between Palæolithic Man and Neolithic Man in support of such a conclusion. All the evidence tends to prove that late Glacial (or post-glacial) Man, together with the great extinct Mammalia, came down approximately to within some 10,000 or 12,000 years of our own times, and that the Rubble-drift marks the stroke of the pendulum when the Glacial period came to a close, and the Neolithic age commenced."

A number of cuts and a map of western Europe showing the chief places submerged illustrate the text (Phil. Trans. Roy. Soc. London, Vol. 184, 1893).

Geological News, General.—According to Mr. Oldham, the three main divisions of India are natural regions. The peninsula consists of land which has not been submerged since the early Paleozoic period. The continental has been frequently under water until the Cenozoic, while the great plain is recent alluvium. There is paleontological evidence of a continuous land connection between India and Africa in the Cretaceous period. At the close of the Cretaceous there was an outbreak of volcanic activity contemporary with a series of earth-movements which led to the first appearance of the extra-peninsular mountains, and the depression at the base of the Himalaya. This activity continued during Cenozoic time. (Nature, Dec., 1893.)

Mr. Robert Hay gives some interesting results of a boring made at Paola, in eastern Kansas, which reaches a depth of 2,500 feet. After passing through the coal measures and subcarboniferous it is difficult to determine the formations, the samples being so finely comminuted. At 2,100 feet granite is reached, at first a gray granite—angular quartz and mica with some feldspar—and then a red feldspar with little mica and no quartz, like the outcrop at Ute Pass, Colorado. (Trans. Kansas Acad. Sci., Vol. xiii).

Archean.—In a study of a group of quartzite exposures in southeastern Wisconsin, Mr. Buell finds evidence of dynamic action accompanying the metamorphism of these rocks which is at variance with the more common structure of the pre-Cambrian quartzites of the region of the Great Lakes and Upper Mississippi, as described by Dr. Van Hise. These differences afford criteria for the separation of the quartzite drift of this area from boulder material from other sources and enables a more exact delineation to be made of the boulder trains that extend upon and within the different glacial formations of the Rock river valley. (Trans. Wisc. Acad., Vol. IX, 1893.)

Mesozoic.—Two new Ammonites from the Cretaceous rocks of Queen Charlotte Island are described by Mr. J. F. Whiteaves. Both specimens are small but clearly referable to the family of Stephanoceratidæ of Neumayer. The first, *Holcostephanus deansii,* belongs to the small group of which *H. astieri* is the type ;the second, *Hoplipes haidaquensis,* is very similar to *H. sinuosus* of the French Neocomian. (Can Record Sci., Oct., 1893.)

According to Mr. S. W. Williston the thickness of the Niobrara rocks in Kansas have been underestimated. Repeated observations at Elkader, in Logan Co., give 290 feet between the bottom of the valley and the highest Niobrara rocks. Wells in the vicinity penetrate 40 feet without passing through the blue chalk. To this, for stratigraphical reasons, he adds 100 feet, giving as a minimum 430 feet at a total thickness at this place. (Trans. Kansas Acad. Sci., Vol. XIII.)

Cenozoic.—Mr. C. T. Simpson reports eight species and one variety of Unios and six species of other fresh water shells from the drift of Toronto, Canada. All the Unios are characteristic forms of the Mississippi Valley, and only three have ever been reported before from Canada. The fossils were obtained from a bed of sand between two glacial beds in a railway cut, 20 or 25 feet above the River Don. Mr. Dall calls attention to the important bearing which these fossils may have upon the theory of a mild interglacial period, during which these Mississippi species attained that region where they flourished for a time and were then destroyed by an advance of the ice. (Proceeds. U. S. Natl. Mus., Vol. XVI, 1893.)

Reasoning from the data gathered for a study of the age of the extra-moraine in eastern Pennsylvania, Mr. E. H. Williams concludes that the total time of the Ice-Age, from beginning to end was small, and of so recent a date that the streams have not reached, in all cases, their pre-glacial bottoms, and the exposed rocks have not had time to acquire signs of decomposition or even oxidation. He inclines to the belief of but one ice age, and that a short and recent one. (Am. Journ. Sci. Jan., 1894.)

Mr. Alfred Bell notes the unique fauna of a post-Tertiary deposit on the shores of the Selsey peninsula in Sussex. Over 330 species in nearly all classes of organic life have been collected, the series exhibiting a purely southern facies free from any northern or boreal forms. An analysis of the list gives the following result: Non-marine, 8 Mammalia, 10 Mollusca, some fragments of insects and 3 plants. Marine, 2 Pisces, 6 Crustacea, 17 Entomostraca, 4 Cirripedia, 4 Annelida, 3 Echinodermata, 216 Mollusca, 10 Polyzoa, 50 Foraminifera, 4 Actinozoa, Algæ, etc. (Annual Report Yorkshire Phil. Soc. for 1892.)

The Manus of Hyopotamus.–Among the treasures obtained in the White River bad lands of South Dakota by the Princeton expedition of 1893 was a fine skeleton of *Hyopotamus*, which was found by Mr. J. B. Hatcher. This specimen presents a number of very unexpected characters, which will be described in a full account of the species, with plates, which is now in preparation. Of these, the most striking is the structure of the fore-foot, *which proves to have five well developed digits,* although the genus is a typical artiodactyl. *Hyopotamus* is thus the third artiodactyl genus in which the manus has been shown to possess five digits, the others being *Oreodon* from the White River and *Protoreodon* from the Uinta Eocene. Kowalowsky's material belonged to many different individuals, and when put together, did not suggest the presence of the pollex. In the specimen before us the first metacarpal is proportionately much longer and heavier than in *Oreodon*; its length is 41 mm. while that of the third metacarpal is 94 mm. It is quite stout, especially anteroposteriorly, and laterally compressed, with well formed distal trochlea, which demonstrates the presence of phalanges. The trapezium is large, but strange to say, has but slight connection with the scaphoid. The proximal surface of the magnum is occupied principally by the scaphoid, though to a less degree than in the oreodonts. The other metacarpals (II–V) are heavier than those which Kowalwsky has figured.

This specimen renders it altogether probable that the earliest artiodactyls were all five-toed and that the larger number of the Eocene members of the group will prove also to have been pentadactyl, though even as early as the Bridger some genera had been reduced to a didactyl condition.—W. B. Scott, Geological Museum, Princeton, N. J., Jan. 16, 1894.